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ABSTRACT

Two experiments investigated the effects of preceding sentence context on the naming times of sentence completion words in third-grade children and college students. In the first study subjects were shown incomplete sentences with four types of target words: best completions; semantically and syntactically appropriate, but less likely completions; related associates of the best completion words; and anomalous words. In the second experiment the target words consisted of those that were both semantically acceptable in the sentence and semantically related to the best completion words; words which were semantically acceptable in the sentence but not strongly related to the best completion words; and semantically unacceptable completion words that were not strongly related to the best completion word. After the incomplete sentence was flashed on a screen, the target word appeared. Students were told to read the target word aloud as rapidly as possible. Results showed that contextual facilitation effects were observed both for highly predictable and for semantically appropriate (but less likely) completions. In both cases, the facilitation effect was much greater for children than for adults. Children also exhibited contextual interference for anomalous word completions, whereas no such effects were observed in adults. (Materials used in the study are appended.) (HOD)

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Automatic, Attentional, And Interactive Processes: Age Differences In The Nature Of Words Affected By Sentence Context[1]

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Running head: AGE DIFFERENCES IN CONTEXT EFFECTS

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Abstract

The effects of preceding sentence context on the naming times of sentence completion words were investigated in third-grade children and college-grade students. Contextual facilitation effects were observed for both highly predictable and for semantically appropriate (but less likely) completions. In both cases, the facilitation effect was much greater for children relative to adults. Children also exhibited contextual interference for anomalous word completions, whereas no such effects were observed in adults. Developmental differences in context effects were negligible for associatively related words which were semantically inappropriate in the sentence. The results were interpreted in terms of a two-factor automatic expectancy/semantic integration model. Both factors are assumed to operate across a wide range of reading experience. Facilitation effects were attributed to both factors. Interference effects were attributed to a semantic integration process operating in children on a word by word basis.

Automatic, Attentional, And Interactive Processes:

Age Differences In The Nature Of Words Affected By Sentence Context

Many recent studies have explored the effects of preceding sentence context on children's visual word identification latency (Perfetti & Roth, 1981; Schwantes, 1981, 1982; Stanovich, West, & Feeman, 1981). In such studies, the student typically reads an incomplete sentence (e.g., The little boy fell down and started to) followed by a sentence completion target word which is to be identified (e.g., cry). Using this procedure three basic findings have been obtained with children. (a) Target words which are semantically congruous with the preceding sentence show shorter identification latencies than the same words presented without prior context. This facilitation effect is also present in adults, although the magnitude of such facilitation is greater for children as compared to adults (Schwantes, 1981; Schwantes, Boesl, & Ritz, 1980). (b) Target words which are semantically incongruous with the preceding sentence show longer latencies relative to a no-context condition. This interference effect is quite marked in children but it is relatively negligible in adults (Schwantes et al., 1980; West & Stanovich, 1978). (c) The degree of context effect in children varies as a function of the probability that the particular target word is elicited by the context (Perfetti, Goldman, & Hogaboam, 1979; Schwantes et al., 1980).

The theoretical framework typically used to explain these findings combines an interactive compensatory assumption (Stanovich, 1980) with a two-process time-locked model of expectancy (Posner & Snyder, 1975; Stanovich & West, 1981). The interactive compensatory assumption

postulates that word identification is based on simultaneous accumulation of information from several knowledge sources. A deficiency in one source may be compensated for by greater use of information from other sources. The two-process time-locked expectancy model postulates that two expectancy processes are activated by preceding context. The first process is characterized as a fast-acting, automatic spreading activation operation which produces contextual facilitation without corresponding interference. The second expectancy process is characterized as a slower-acting directed attention operation which produces both facilitation beyond that from the automatic expectancy process, as well as interference. Word identification ability is assumed to function so rapidly in adults that only the fast-acting automatic expectancy process has time to operate, producing contextual facilitation. In young children, word identification ability is assumed to function more slowly (Schwantes, 1981) so that the slower-acting directed attention expectancy process has time to operate, producing both relatively greater contextual facilitation for correct expectancies and interference for incorrect expectancies. Thus, a number of researchers have suggested that the effect of context on word identification is influenced primarily by a directed attention process in children and by an automatic spreading activation process in adults. In addition to accounting for the differential magnitudes of contextual facilitation and interference between children and adults, this type of explanation also has implications for the degree of specificity of the context effect observed in children as compared to adults.

The purpose of the present study is to investigate whether the size and nature of the set of words potentially influenced by sentence context

is greater in adults than in children. The basic argument presented here is that the automatic expectancy process has a general facilitation effect which covers a relatively wider range of words; while the attentional expectancy process has a more specific facilitation effect which covers a much narrower set of words. If this is the case, then sentence context may potentially influence and facilitate the identification of a much broader range of words in adults than in children. Consequently, although the magnitude of contextual facilitation is greater in children as compared to adults, this facilitation effect is hypothesized to cover a much smaller set of words in children than in adults.

The automatic spreading activation process as described by Collins and Loftus (1975) assumes that each concept in memory is represented as a node in a semantic network. Each concept node is linked to other nodes which are associated with or which describe properties of that concept. When the semantic and syntactic constraints of a sentence context activate a concept, the signal spreads outward from that concept activating other nodes in the network. The degree of activation of an associated node is influenced by a number of factors, including the time elapsed since activation, the distance and number of paths between these nodes, and the strength of the association between the particular nodes in the network pathway. The result of activation of a node is to make that node easier to access, such that less sensory information is required to identify the word which names the node concept. Contextual facilitation is assumed to occur whenever the concept named by the target word is activated by the sentence information. Within this framework, sentence context should activate the nodes which represent those words that best fit or best

complete the sentence. There are however at least two additional classes of words which may be potentially activated: other semantically and syntactically appropriate, but less likely completion words in the sentence; and words which are associated with or related to the best completion word. Thus maximum facilitation should occur for the words which best fit the sentence information, but some automatic facilitation should also occur for words which form acceptable, but less likely completions to the sentence, as well as for words that are highly related to the best completion word. In addition, the automatic spreading activation process does not affect the retrieval of information from nodes which are not activated by the sentence context. Thus, the automatic activation expectancy process is predicted to produce a general contextual facilitation effect for a broad range of words, but should not produce an interference effect for words which are incongruous with preceding context. Some adult data consistent with this notion have been reported by Kleiman (1980).

In contrast, the directed attention expectancy process as described by Posner and Snyder (1975), LaBerge and Samuels (1974), and Stanovich and West (1981) has been characterized as a means of responding to a preceding cue or context by directing a limited-capacity processor to the memory location of the expected stimulus. In comparison to the automatic spreading activation process, the number of concept nodes that can be activated by attentional expectancy is sharply reduced. If the expected stimulus word is presented, the processing of that stimulus should be facilitated. If instead a different stimulus occurs, the reader must shift attention away from the expected word to a new memory

location so that information can be accessed. In this sense the operation of the directed attention mechanism serves to inhibit the retrieval of information from an unexpected location until the limited capacity processor is shifted to that location. Within this framework, the effect of sentence context will be one of facilitation for those words that best fit or best complete the sentence. Given the focus of attention on a dominant predictable item, the identification of other appropriate but less likely word completions and of related word completions may not be facilitated.

Experiment 1

In the present study developmental differences in the size and nature of the set of words primed by sentence context were investigated by varying the degree of relationship of the presented target word to the word which best completed the preceding sentence context. Four types of target words were presented following an incomplete sentence: best completions; semantically and syntactically appropriate, but less likely completions; related associates of the best completion words; and anomalous words. Best completion words and appropriate less likely words were determined from a sentence completion task. Related associates of best completion words were determined from a word-association task. Anomalous completions were produced by randomly interchanging best completion target words across original contexts. If children's word identification is affected primarily by the directed attention process, then contextual facilitation might be observed only for the best completion targets. As suggested by the data of Schwantes et al. (1980), context use in young readers may be of specific benefit only

when the stimulus item is accurately predicted. Adults' word identification, however, is assumed to be affected primarily by the automatic spreading activation process. For adults, greatest contextual facilitation should be observed for best completion targets, but some facilitation should also be observed for appropriate less likely completions and for related associates of best completions.

Method

Subjects. The subjects were 18 third-grade children (with a mean age of 8-6 and a range of 7-10 to 9-0) and 18 college students (with a mean age of 19-5 and a range of 18-0 to 21-4). The children were volunteer participants recruited from an elementary school serving both a small urban and a rural community. The college students were volunteer participants recruited from an introductory psychology class at a four-year university.

Stimuli. The test stimuli consisted of 108 nine-word sentences (see Appendix A). Each sentence was presented to the subject in two parts: the sentence context containing the first eight words of the sentence, and the target word which completed the sentence. Each target word formed one of four different sentence completion conditions: best completion, less likely completion, related completion, or anomalous completion. The 108 test stimuli were derived from an initial pool of 180 nine-word sentences. This larger pool of stimuli was presented in a sentence completion task. This task was administered to 25 students from each of the third and college grade levels. None of these students participated in any orther portion of the study. In this task the first eight words of each sentence were read to the students, after

which they wrote down the word they believed best completed that sentence. A different set of thirty incomplete sentences was read to the same groups of students on each of six successive school days. One hundred forty-four best completion words were obtained from this task.

A best completion word was defined as that word which was provided as the completion word to the sentence by both at least 80% of the third graders and by at least 80% of the college students. For example, the context "Out in the rain he got cold and" was completed with the target word "wet" by 96% of the third graders and by 96% of the college students. All of the test sentences used in the study had best completion words, but these words were only presented as target words in the best completion condition.

Fifty-four of these best completion words and their contexts were randomly chosen to serve in the best completion target word condition. Averaging across these sentences, the mean percentage of students from each grade who responded with the same best completion target words was 95.9 for third graders and 95.4 for college students.

A less likely completion word was defined as a semantically and syntactically appropriate word to the sentence that was provided as the completion word in the sentence completion task by both between 4% and 20% of the third graders and by between 4% and 20% of the college students. For example, the context "He jumped in his car and away he" was completed with the word "drove" by 4% of the third graders and also by 4% of the college students. Eighteen less likely word completions and their corresponding sentence contexts were selected from the above pool of 90 remaining stimuli and were used in the less likely completion target word condition. Averaging across these sentences, the mean

percentage of students from each grade who responded with the same less likely but appropriate completion words was 5.6 for third graders and 6.9 for college students.

Related completion words were obtained by using the remaining 72 best completion words from the sentence completion task. These words were employed as stimuli in a word association task. This task was administered to 25 students from each of the third and college grade levels. Again, none of these students participated in any other portion of the study. In this task each stimulus word was read to the students, immediately after which they wrote down the word they thought of after listening to the stimulus word. A different set of twenty-four stimulus words was read to the same groups of students on each of three successive school days. A related word was defined as that word which was provided by both the third graders and by the college students as the most frequent associative response to the stimulus word. For example, the word "under" was given as the most frequent response to the stimulus "over" by third graders (60% responded with "under") and by college students (56% responded with "under"). This word was then presented as a related completion target with the context "They went to bed after the movie was". Eighteen such related words and their corresponding sentence contexts were selected for use in the related completion target word condition. Averaging across these target words, the mean percentage of students from each grade who responded with the most frequent word associate was 56.4 for third graders and 55.1 for college students.

Eighteen of the remaining best completion words and their sentence contexts were randomly chosen for use in the anomalous completion target

word condition. Stimuli in this condition were constructed by randomly re-pairing completion words with contexts. For example, the context "All the children got up to go to" was paired with the target completion "street".

All subjects saw the same 108 target words, although presentation of each target word in the context versus a no-context condition was counterbalanced across subjects. Seventy-two target words were preceded by an eight-word context and 36 target words were presented without preceding context (the no-context condition). The 72 targets in the context condition were comprised of 36 best completions, 12 less likely completions, 12 related completions, and 12 anomalous completions. Ordering of the 108 test trials comprising the no-context and the four context target completion conditions was random.

Three different lists of the 108 test trials were constructed. In each list two-thirds of the words of every target completion condition were presented in the context condition and the remaining one-third of these words was presented in the no-context condition. Across lists every target word appeared equally often in the context condition and every target word appeared equally often in the no-context condition. Two different random orderings of the trials were used for each list. No subject saw the same target word or sentence more than once during the course of the experiment.

Apparatus. Separate negative slide photographs were constructed for each eight-word context and for each target word. Blank negatives were constructed for the no-context condition. These slides were back-projected onto a translucent screen by two Kodak Carousel slide

projectors. One projector contained the context and blank slides; the other projector contained the target word slides. The images of the two projectors were aligned so that the target word appeared directly below the context. The subject sat approximately 55 cm from the screen. A five-letter word subtended a horizontal visual angle of approximately 2.0 degrees.

Target onset was controlled by a Lafayette electronic shutter attachment that was placed over the lens of the projector that contained the target slides. When the experimenter pushed a control button the shutter opened immediately and the projected image of the target word appeared on the screen. A Hunter Kolckounter, accurate to the millisecond, was started by the same push of the control button. When the subject responded verbally to the target, a voice-activated relay stopped the clock and closed the shutter. The microphone that led to the voice-activated relay was situated on the table directly in front of the subject.

Procedure. Subjects were tested individually in a session that lasted approximately 20 minutes. They were told to read aloud the sentence context that appeared on the screen in front of them. Immediately after the subject pronounced the last word of the context (or when a blank no-context slide was presented, immediately after they said "ready"), the target word appeared on the screen. Subjects were told to read the target word aloud as rapidly as possible. The subjects were told that only the response to the target word was timed, so they were free to read the context at a comfotable pace. The session began with the presentation of eight practice

trials. This was followed by presentation of the 108 test trials. A brief rest period was provided following the completion of each quarter of the test trials.

Results and Discussion

Trials on which the target word was incorrectly named and trials on which the response time was greater than 2000 msec were scored as subject errors and were dropped from the reaction-time analysis. The mean reaction time and the mean percentage of errors in each condition are displayed in Table 1. As may be observed in that table, response accuracy was quite high in each condition and the overall percentage correct was 93.0 for third graders and 98.6 for college students.

Insert Table 1 about here

The mean reaction times for correct responses for each subject in each condition were used in a 2(grade) x 2 (context presence vs. absence) x 4(target condition) analysis of variance. The major outcome of this analysis was a significant triple interaction of grade x context x target condition, $F(3, 102) = 6.51$, $p < .01$. As indicated in Table 1, the context effect (difference between the no context and context condition) is greater for children than for adults, although the magnitude of this developmental difference varies as a function of target condition. Follow-up analyses were conducted for each target condition. In the best completion target condition, follow-up analyses indicated that a significant contextual facilitation effect was present both for third grade students, $F(1, 17) = 64.75$, $p < .01$, and for

college students, $F(1, 17) = 67.99$, $p < .01$. A significant grade x context interaction in this condition reflected the observation that the magnitude of facilitation was significantly greater for the third graders, $F(1, 34) = 10.78$, $p < .01$.

A parallel set of findings was obtained in the less likely completion target condition. A significant contextual facilitation effect was present both for third grade students, $F(1, 17) = 11.34$, $p < .01$ and for college students, $F(1, 17) = 8.52$, $p < .01$. The magnitude of this facilitation effect was again significantly greater for third graders, grade x context interaction, $F(1, 34) = 4.58$, $p < .05$. As may be seen in Table 1, the degree of contextual facilitation in the less likely target condition for each grade level was much smaller than that obtained in the best completion target condition.

In the related target condition the magitude of contextual facilitation was also smaller than that obtained in the best completion target condition, although the main effect of context was still significant, $F(1, 34) = 6.48$, $p < .05$. The relatively larger context effect observed for the third graders did not significantly differ from that of the college students; the grade x context interaction was not significant.

In the anomalous target condition, it may be seen that contextual interference was present for third grade students, $F(1, 17) = 9.42$, $p < .01$, but not for college students, $F < 1$. The grade x context interaction was reliable, $F(1, 34) = 7.59$, $p < .01$.

The developmental findings in the best completion and anomalous target conditions replicate those from other studies (e.g., Schwantes,

1981; West & Stanovich, 1978) in that relatively greater contextual facilitation as well as contextual interference effects were found for children, but only contextual facilitation was found for adults. Such findings have been interpreted in terms of directed attention processes operating in children and spreading activation processes operating in adults. On the basis of such an interpretation, it was hypothesized that adults, but not children, would also show facilitation in the less likely and related target conditions. Only the adult data were consistent with this hypothesis. Significant contextual facilitation was present for adults in the less likely and related target conditions. These findings are compatible with the operation of an automatic spreading activation process in adults. For children, contextual facilitation was also present in the less likely target condition and this facilitation was significantly greater than that observed for adults. This finding suggests that the directed attention process operating in children may be described as one which enhances the identification of several words which would be semantically acceptable within the sentence context frame. The contextual facilitation effect in children may be strongly related to the general semantic acceptability of the word within the sentence.

It must be pointed out, however, that performance in the related target condition shows a similar developmental trend, albeit nonsignificant, to that obtained in the less likely target condition. Marked contextual facilitation was again present for children. Pertinent to this finding are the observations from a post-hoc examination of the stimuli employed in this related target condition.

This examination revealed that several of the target words used in this condition were not only related to the best completion word, but were also semantically acceptable within the sentence context (e.g., the context "When I get sick my mother calls the" was paired with the target word "nurse"). Other related target words were not semantically acceptable within the sentence context (e.g., "The fire will burn for a very long" was paired with the target word "clock"). The mean response times for these two types of related target words (semantically acceptable and semantically unacceptable) were calculated for each age group. For the related target words which were semantically acceptable, it was observed that the degree of contextual facilitation was much greater for children relative to adults. This developmental difference was similar in magnitude to that obtained for the less likely target words. However, for the related target words which were semantically unacceptable, it was observed that the degree of contextual facilitation, and, in particular, the developmental differences in contextual facilitation were relatively attenuated. Because the number of trials presented to each subject was so few for each of these two types of related targets, no statistical analyses were performed on these data. Nevertheless, this post-hoc breakdown of the data yields information which is consistent with the notion that the process underlying the relatively greater context effects on children's word recognition speed is not so much linked to a single specific expectancy operation, but may be more closely linked to the semantic acceptability vs. unacceptability of the words within the sentence frame. This notion was investigated more directly in the second

experiment.

Experiment 2

There were two findings of particular interest from Experiment 1 which provided the impetus for the second experiment. First, contextual facilitation was significantly greater in children as compared to adults for those target words which were less likely completions to the sentence, although still semantically acceptable in the sentence. Second, although sentence context facilitated recognition of those target words which were related to the best completion word, a post-hoc inspection of these data indicated that such facilitation was markedly greater for children relative to adults only when the related completion words were also semantically acceptable in the sentence.

One aspect of this second experiment includes an attempt to replicate the finding of developmental differences in degree of contextual facilitation for less likely completion target words. However, the major focus of this second experiment is to examine the hypothesis that developmental differences in contextual facilitation would be obtained for semantically acceptable words, regardless of their degree of semantic relatedness to the best completion word. Four types of target words were presented following an incomplete sentence: words which were both semantically acceptable in the sentence and semantically related to the best completion word; words which were semantically acceptable in the sentence but not strongly related to the best completion word; semantically unacceptable completion words which were related to the best completion word; and semantically unacceptable completion words which were not strongly related to the

best completion word.

Method

Subjects. The subjects were 20 third-grade children (mean age 9-1, range 8-6 to 9-8) and 20 college students (mean age 18-7, range 17-6 to 20-11). Subjects were recruited in the same fashion as described in Experiment 1.

Stimuli. The test stimuli consisted of 112 nine-word sentences (see Appendix B). As in the first experiment, stimulus presentation consisted of the preceding sentence context followed by the sentence completion target word. Each target word formed one of four different sentence completion conditions: acceptable-related, acceptable-unrelated, unacceptable-related, or unacceptable-unrelated. The 112 test stimuli were taken from the pool of 144 best completion words obtained in Experiment 1. As in Experiment 1, all test sentences had best completion word endings; however, in the present experiment none of these best completion words was paired as a target with its corresponding sentence.

Target words used in the two related completion conditions were obtained as in Experiment 1. In the acceptable-related completion target condition, 28 words were used which were acceptable in their sentence contexts and which were also related to the best completion words for these sentences. For example, the word "snow" was given as the most frequent response associate to the stimulus "rain" by third graders (40% responded with "snow") and by college students (48%). This word was presented as an acceptable-related target with the context "The sky turned dark and it started to". Averaging acro-s these target words, the mean percentage of students who responded with the most

frequent word associate was 45.6 for third graders and 46.9 for college students.

In the unacceptable-related completion target condition, 28 words were used which were semantically unacceptable in their sentence contexts, but which were related to the best completion words for these sentences. For example, the word "dog" was given as the most frequent response associate to the stimulus "tail" by third graders (40%) and by college students (48%). This word was presented as the unacceptable-related target with the context "Every fox has a white tip on its". Averaging across these target words, the mean percentage of students who responded with the most frequent word associate was 40.6 for third graders and 46.1 for college students.

In the acceptable-unrelated completion target condition, 28 words were used which were defined as were the less likely target words in Experiment 1, with the additional restriction that none of these words was given as the most frequent response associate to the best completion word. For example, the context "The children got on the horse for a" was completed with the word "picture" by 4% of the third graders and also by 4% of the college students. Averaging across the stimuli in this condition, the mean percentage of students from each grade who responded with the same less likely but semantically appropriate completion words was 5.1 for third graders and 4.9 for college students. This condition is most analogous to the less likely target condition of Experiment 1.

In the unacceptable-unrelated completion target condition, 28 words and their contexts were re-paired such that the targets were

both semantically unacceptable in their sentence contexts and unrelated to the best completion words for these sentences. For example the context "Johnny grew up to be a fine young" was paired with the target completion "shoe". This condition is most analogous to the anomalous target condition of Experiment 1.

All subjects saw the same 112 target words although presentation of each target word in the context versus the no context condition was counterbalanced across subjects. Half of the target words were preceded by an eight-word context while the remaining half were presented without preceding context (the no context condition). The 56 targets presented in the context condition were comprised of 14 targets from each target completion condition. Ordering of the 112 trials was random.

Two different lists of the 112 test trials were constructed such that those words presented in the context and no context conditions in list one were presented in the no context and context conditions, respectively, in list two. Across lists every target word appeared equally often in the context and no context conditions. Two different random orderings of the trials were used for each list. No subject saw the same target word or sentence more than once during the course of the experiment.

Apparatus and Procedure. The apparatus and procedure were the same as those described in Experiment 1.

Results and Discussion

Trials on which the target word was incorrectly named and trials on which the response time was greater than 2000 msec were again

scored as subject errors and were dropped from the reaction time analysis. The mean reaction time and the mean percentage of errors in each condition are displayed in Table 2. As may be observed in that table, response accuracy was very high in each condition and the overall percentage correct was 95.5 for third graders and 96.5 for college students.

Insert Table 2 about here

The mean reaction times for correct responses for each subject in each condition were used in a 2(grade) x 2(context presence vs. absence) x 4(target condition) analysis of variance. The major outcome of this analysis was a significant triple interaction of grade x context x target condition, $F(3, 114) = 13.07$, $p < .01$. As indicated in Table 2, the context effect is greater for children than for adults, although the magnitude of this developmental difference varies as a function of target condition. Of particular interest is the observation that the developmental difference in size of the context effect is very similar in the acceptable-related and acceptable-unrelated target conditions; and that this developmental difference in context effect magnitude is markedly reduced in the unacceptable-related target condition. The attenuation of developmental differences in context effect size in this latter condition is due primarily to a relatively smaller context effect for third graders.

Follow-up analyses were conducted for each target condition. In the acceptable-related condition, significant contextual facilitation

was present for both third graders, $F(1, 19) = 13.48$, $p < .01$, and for college students, $F(1, 19) = 5.96$, $p < .05$. A significant grade x context interaction in this condition reflected the observation that the magnitude of facilitation was significantly greater for the third graders, $F(1, 38) = 4.23$, $p < .05$.

An identical pattern of findings was obtained in the acceptable-unrelated condition. A significant contextual facilitation effect was present both for third grade students, $F(1, 19) = 14.12$, $p < .01$, and for college students, $F(1, 19) = 5.59$, $p < .05$. The magnitude of this facilitation effect was again significantly greater for third graders, grade x context interaction, $F(1, 38) = 4.97$, $p < .05$.

In the unacceptable-related condition, the magnitude of the context effect was similar across grade levels, and the grade x context interaction was not significant. The main effect of context was significant in this condition, $F(1, 38) = 5.64$, $p < .05$.

In the unacceptable-unrelated condition, it may be seen that contextual interference was present for third grade students, $F(1, 19) = 40.87$, $p < .01$, but not for college students, $F < 1$. The grade x context interaction was reliable in this condition, $F(1, 38) = 27.00$, $p < .01$.

For adults, significant contextual facilitation was obtained for target words which were semantically acceptable in the sentence context, both when these targets were presented in the related and in the unrelated condition. In addition, significant contextual facilitation was obtained for adults when the target word did not complete the sentence in a meaningful way, but was still related

to the best completion word. The degree of contextual facilitation obtained for adults was quite similar across these three conditions, and very comparable to those obtained for adults in the less likely condition and in the related condition of Experiment 1. Across both experiments, greatest facilitation was obtained for adults in the best completion condition of Experiment 1. Although of lesser magnitude, significant facilitation effects were also obtained for target words which were semantically acceptable but far less predictable in the context than the best completion words; and significant facilitation effects were obtained for target words which were related associates to the expected words. Thus, for adults a general contextual facilitation effect was obtained across a broad range of semantically acceptable words and words related to semantically acceptable words.

Of greater interest is the observation that for the third graders, contextual facilitation was also present in the two conditions when the target word was semantically acceptable in the sentence context, even though this word was not the dominant expected completion item. Furthermore, the magnitude of the facilitation effect in these semantically acceptable conditions was significantly greater for third graders as compared to adults, regardless of the degree of relatedness of the target to the best completion word. These developmental findings replicate those obtained in the less likely target condition of Experiment 1. In the unacceptable-related target cordition the degree of contextual facilitation for third graders was sharply reduced, as was the developmental difference in contextual facilitation.

Across both experiments, the largest developmental difference in facilitation was present in the best completion condition of Experiment 1. Pronounced developmental differences in facilitation effects were also present for semantically acceptable target words which were much less predictable in the sentence context than the best completion items. However, developmental differences in contextual facilitation were negligible for target words which were related to the best completion word, but which were not also semantically acceptable in the sentence context. Thus, the semantic acceptability of the word in the sentence context has a much greater influence on children's as compared to adults' word identification times, both when the word is highly predictable, as well as when it is much less predictable in the sentence context.

General Discussion

The present study was designed to investigate developmental differences in the size and nature of sentence context effects on word identification latency. Three major findings were obtained. Each of these findings is pertinent to one of the three predictions derived from the processing-time, interactive-compensatory model of reading (Stanovich, 1980). First, it was predicted that for highly predictable best completion words, greater facilitation from preceding context would be obtained for third graders relative to adults. The results from the best completion target condition of Experiment 1 are consistent with this prediction. Second, it was predicted that children, but not adults, would display interference effects for contextually anomalous words. The results from the anomalous

target condition of Experiment 1 and from the unacceptable-unrelated target condition of Experiment 2 are consistent with this prediction. Third, it was predicted that adults, but not children, would display contextual facilitation effects for less predictable words and for words related to the best completion words. In the less likely condition of Experiment 1 both the adults (as predicted) and the children (contaray to prediction) displayed marked contextual facilitation effects. These findings were replicated for both age groups for the low probability targets in the acceptable-related and in the acceptable-unrelated conditions of Experiment 2.

The first and second findings replicate the prior results obtained by Schwantes (1981), Schwantes et al. (1980), and West and Stanovich (1978). This pattern of findings has been interpreted previously in terms of the influence of an automatic spreading activation process on adults' performance and the influence of a slower-acting directed attention expectancy process on children's performance. The adult data from the third finding are also consistent with this interpretation, but the child data from the third finding are not consistent with this interpretation.

The overall college grade data in the present study are quite compatible with the notion that an automatic spreading activation process is the primary influence on the contextual effects observed in adults. Adults' word recognition times displayed contextual facilitation not only for highly predictable words, but also for semantically acceptable - less predictable words, as well as for semantically unacceptable words which were associatively related

to the best completion word. In these latter two conditions, the target words were less likely to benefit from conscious predictions, but were likely to benefit from the activation which spreads from words primed by the sentence context. The findings in these conditions are consistent with the operation of a general automatic semantic priming effect. This effect may result not only from individual words in the sentence, but also from inter-word combinations which prime the semantic network (Schwantes, in press; West & Stanovich, 1982).

The overall child data and the pattern of developmental findings in the present study are not consistent with the operation of a directed attention expectancy process as the major influence on the children's performance. The attentional expectancy process has been characterized as producing contextual facilitation for a relatively narrow range of items. The finding that children's word identification time was contextually facilitated across a wide range of semantically acceptable words in the sentence context (for low predictable words, as well as for dominant completion items) is difficult to account for in terms of the directed attentional expectancy process. In fact, the completion probability of the semantically plausible, low predictable words in Experiments 1 (less likely condition) and 2 (acceptable-related and acceptable-unrelated) was so low that if conscious expectancies were being generated, interference for these words would be expected; a result that was not obtained in any of the low probability semantically acceptable target conditions of the present study. It should be noted that the low probability words in these conditions were neither

less familiar nor more difficult to read.

While the children's data are not consistent with the operation of an attentional expectancy process, neither is their performance entirely consistent with an interpretation based solely on an automatic spreading expectancy operation. Two sets of developmental findings must be taken into account in attempting to provide a general conceptual framework for understanding the children's data. First, children showed relatively greater degrees of contextual facilitation than adults when the target word was semantically congruent with the sentence. This finding was obtained whether the word was the best completion item or a less likely completion item (Experiment 1). This developmental difference for low probability items was replicated in the two semantically acceptable target conditions of Experiment 2. Second, children displayed contextual interference in both experiments, whereas no such interference was present for adults.

A potentially useful framework for conceptualizing the obtained pattern of developmental findings may be provided by an expectancy/integration model of context effects. This model includes the interactive-compensatory assumption and distinguishes between contextually based effects from an automatic expectancy process and contextually based effects from an attentional-integrative process. Both of these processes are assumed to operate across a wide range of reading experience. The automatic expectancy process, as described earlier, is assumed to operate via spreading activation which primes a relatively large set of words in accordance with their degree of relationship in the associative semantic network. These activated

words require less perceptual information for recognition, and thus contextual facilitation (but not interference) is produced by this process. In addition it is assumed that this automatic process is not under subject control and that it does not deplete cognitive capacity (cf. Stanovich & West, 1983). The major developmental changes associated with this process relate to basic changes in the accessibility and organization of the semantic network.

The attentional-integrative process is not viewed as an expectancy process operating prior to information pick up. Rather it is assumed to focus on and to integrate information incoming from different processing levels (visual, lexical, syntactic, semantic) and to make decisions based upon this combined information. Contextual information may either facilitate or interfere with this integration process. The operation of this process is conceptualized as being similar to the general decision making problem solver in McClelland's (1979) cascade model and in Forster's (1979) language processing model. The attentional-integrative process, like the automatic expectancy operation, is assumed to operate in the same general fashion in both children and adults, i.e., information from different sources is combined and a decision concerning this information is obtained; but unlike the automatic expectancy operation, this process is assumed to require cognitive capacity. The major developmental changes associated with this process relate to the size of the linguistic frame which is being focused on and integrated. Young readers may focus their attention on integrating that information which is directly pertinent to individual word identification and meaning. Since word identification is one of the primary aspects of early reading development, the young reader's attention

may be captured by and focused upon this process. More experienced readers may focus their attention on extracting meaning from larger units (e.g., phrases, clauses) and on integrating this with the overall message meaning. Thus, the underlying processes of automatic expectancy and attentional integration are operative in and serve similar functions in both children and adults; the key difference is the size of the linguistic frame being attended to during the attentional integrative process.

Within this expectancy/integration model, contextual facilitation for word identification may stem from automatic spreading activation as well as from the attentional-integration process. In relatively young readers contextual expectancy effects are automatic (West & Stanovich, 1978), but word recognition may not yet be automatic (cf. LaBerge & Samuels, 1974) and the focus of attention is on integrating that information which is directly pertinent to word identification. As in adults, the automatic expectancy process serves to delimit and prime a potential pool of relevant words. Recognition of any of these primed words will be facilitated as a result of this process. However, encoding of visual information is still relatively slower in younger readers (Maisto & Baumeister, 1975; Schwantes, 1981, 1982) and in poorer readers (Maisto & Sipe, 1980; Perfetti & Roth, 1981; Simpson, Lorsbach, & Whitehouse, 1983) and this allows additional time for information from the message processor (Forster, 1979) to have an effect on the information accumulating from word identification. Information from the message processor may affect word recognition directly by facilitating the ongoing processing of visual and lexical information or it may function indirectly by increasing

the accessibility of the processed visual and lexical data to the general problem solver. In either case, recognition of those words which are semantically plausible with the meaning of the sentence would be facilitated. In adults, word recognition is typically automatic (an exception would occur when the stimulus word is visually degraded, see Schwantes, 1981; Stanovich & West, 1979). When word identification is automatic, the attentional integrative process is still operative, but it is assumed to be directed toward higher levels of semantic extraction, formation of inferences, etc. Under normal comprehension demands this process does not influence automatic word recognition.

Contextual interference with children's word identification is not assumed to stem from incongruities with conscious expectancies or predictions. Rather, within the present model, interference with word identification results from the focus of the attention-integration process at the level of word recognition and extraction of individual word meaning. When integration is occurring word by word and an anomalous word is presented, the decision maker may detect an incompatibility between the meaning of the recognized word and the information from the message processor concerning the meaning of the prior sentence context. Under such conditions, additional analyses may be performed (e.g., conducting a second look at the visual information, checking for additional meanings of the recognized word, attempting to revise the context meaning, etc.). These additional analyses require time and may slow down decision and response processes, resulting in a contextual interference effect (for a similar suggestion see Mitchell & Green, 1978). Thus, when the attentional-integrative process is operating in

a word by word fashion, as may be the case with young readers, contextual interference for anomalous words will be obtained. When this process is focused on extracting and integrating the meanings of larger units (e.g., phrases), as may be the case with adults, then contextual interference with recognition of an individual word may not be obtained.

The failure to obtain interference for the third graders in the unacceptable-related condition may initially appear to be inconsistent with the proposed source of interference in the present model. However, this apparent inconsistency does not render the distinction between the expectancy effect and the integrative effect less useful. Rather this finding suggests that additional empirical work is required to sharpen the definition of semantic incompatibility and to delineate the conditions under which such an incompatibility may be detected. For example, the finding for children in the unacceptable-related condition of Experiment 2 might be explained if it is assumed that semantic compatibility for children at the word level consists of merely the detection of either an associative relatedness and/or of a semantic relatedness with prior contextual material.

In summary, an expectancy/integration model has been proposed to account for developmental differences in the effects of context on word recognition. This model shares some general similarities to that recently described by Stanovich and West (1983). The model assumes that sentence context activates a single expectancy process that affects word recognition. This process is assumed to be automatic and it is assumed to operate in both young children and adults. Contextual effects at the level of word recognition may also derive from an attentional-integration

process which operates during, but not prior to, the analysis of incoming information. If word recognition in young readers is not automatic, their attention may be focused on integrating different sources of information at the word level. In this case, contextual effects on word recognition beyond that from automatic expectancy may be observed. In adults, word recognition is assumed to be automatic. Consequently, their attention may be focused elsewhere, e.g., on integrating higher levels of information, forming inferences, etc. In this case, contextual effects on word recognition may derive only from automatic expectancies. An interesting speculation is that a transition phase occurs during the middle to later elementary school years. During this transition phase, word recognition may become automatic, but integration of the semantic message may still occur on a word by word basis. The integration process may consist of a post-recognition comprehension check of each word with the sentence meaning. This would result in a similar degree of facilitation as that found in adults (and smaller than that obtained with younger readers), but a greater degree of interference as compared to adults. The empirical results from the sixth grade data of West and Stanovich (1978), Schwantes et al. (1980), and Schwantes (1982) are consistent with such speculation.

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APPENDIX A
Stimuli Used in Experiment 1

Best Completion Condition

Context	Best Comp	% 3rd	% Col	Target Stimulus	% 3rd	% Col
He failed because he could not subtract or	add	100	84	add	100	84
I never want to do anything like that	again	96	92	again	96	92
My dog ran away a long long time	ago	100	100	ago	100	100
His friends went away and left him all	alone	88	96	alone	88	96
He put all his money in the downtown	bank	100	96	bank	100	96
The little girl was stung by a big	bee	88	92	bee	88	92
My grandma baked about nine loaves of homemade	bread	84	100	bread	84	100
They went to school in a big yellow	bus	100	92	bus	100	92
My family moved from the country to the	city	96	96	city	96	96
Green, blue and red are my very favorite	colors	96	100	colors	96	100
The farmer went to milk the very big	cow	100	96	cow	100	96
The little girl fell down and started to	cry	100	96	cry	100	96
Last Saturday turned out to be a beautiful	day	100	96	day	100	96
All the old apple trees must be cut	down	96	100	down	96	100
I will cut up some wood for the	fire	100	96	fire	100	96
On the playground we run around and have	fun	100	96	fun	100	96
It was the very best time I ever	had	100	96	had	100	96
The wind blew my hat right off my	head	100	100	head	100	100
Mary went over to play at her friend's	house	96	84	house	96	84

(table continues)

Context	Best Comp	% 3rd	% Col	Target Stimulus	% 3rd	% Col
I heard my stomach growl because I was	hungry	88	100	hungry	88	100
My balloon got away and I couldn't catch	it	100	100	it	100	100
The door was locked so I used my	key	96	100	key	96	100
I fell off my bike and skinned my	knee	96	92	knee	96	92
The children stepped back to take a good	look	92	92	look	92	92
I liked him from the first time we	met	92	96	met	92	96
To buy a present I need some more	money	96	100	money	96	100
I've eaten so much I can't eat any	more	96	100	more	96	100
It is hard to get up in the	morning	88	100	morning	88	100
Everyone went home so I was all by	myself	100	100	myself	100	100
She remembered my face but she forgot my	name	84	96	name	84	96
If you don't have a pencil use a	pen	92	100	pen	92	100
When teeth fall out put them under your	pillow	100	100	pillow	100	100
The lady in the library said to be	quiet	100	92	quiet	100	92
The sky turned dark and it started to	rain	96	88	rain	96	88
My father always uses too much pepper and	salt	100	96	salt	100	96
The farmer told us that wool comes from	sheep	96	84	sheep	96	84
I had to ask her to tie my	shoe	92	100	shoe	92	100
The cat curled up and soon went to	sleep	100	100	sleep	100	100
He looked at the sun and the blue	sky	96	84	sky	96	84

(table continues)

Context	Best Comp	% 3rd	% Col	Target Stimulus	% 3rd	% Col
In the winter everything is covered with white	snow	100	100	snow	100	100
Every fox has a white tip on its	tail	96	88	tail	96	88
She combed her hair to have her picture	taken	84	96	taken	84	96
She asked me the secret but I wouldn't	tell	100	92	tell	100	92
First he looked over here and then over	there	100	100	there	100	100
He did what he thought was the right	thing	92	84	thing	92	84
He took something to drink because he was	thirsty	84	100	thirsty	84	100
Did you stay out of trouble at school	today	96	100	today	96	100
I can't go today but I can go	tomorrow	100	100	tomorrow	100	100
He rested in the shade under a big	tree	100	80	tree	100	80
He was staying with his aunt and his	uncle	100	96	uncle	100	96
Before you cross the street always look both	ways	100	92	ways	100	92
Out in the rain he got cold and	wet	96	96	wet	96	96
The bird couldn't fly because of its broken	wing	96	100	wing	96	100
Then you can walk to school all by	yourself	96	100	yourself	96	100
Means		95.9	95.4			

Less Likely Condition

Context	Best Comp	% 3rd	% Col	Target Stimulus	% 3rd	% Col
The cat chased and tried to catch the	mouse	80	84	bird	04	12
Johnny has five big brothers and one little	sister	92	96	brother	08	04

(table continues)

Context	Best Comp	% 3rd	% Col	Target Stimulus	% 3rd	% Col
He jumped in his car and away he	went	80	80	drove	04	04
The baseball hit the house and broke the	window	92	96	glass	04	04
The lake water was colored a beautiful dark	blue	92	80	green	04	20
I stopped at the store on my way	home	92	84	here	04	04
She didn't want to tell how old she	was	92	96	is	08	04
I wished that I could fly like a	bird	80	84	jet	04	04
The boy got the lawnmower to cut the	grass	96	80	lawn	04	20
One boat is long and the other is	short	84	96	little	04	04
I'm not going to worry about it very	much	84	92	long	08	08
The pen was empty so I threw it	away	80	84	out	08	12
The children got on the horse for a	ride	92	96	picture	04	04
I went to bed because I was so	tired	80	80	sick	12	04
The elevator broke so we walked up the	stairs	92	96	steps	08	04
They all went to sleep in one big	bed	96	80	tent	04	04
The player hit the ball way over the	fence	80	88	wall	04	04
It is dark in the middle of the	night	92	80	woods	04	04
Means		88.0	87.3		5.6	6.9

Related Condition

Context	Best Comp	% 3rd	% Col	Target Stimulus	% 3rd	% Col
Bananas and oranges are my favorite kinds of	fruit	100	92	apple	36	20
Before eating dinner I had to set the	table	100	92	chair	52	88
The fire will burn for a very long	time	100	100	clock	72	60

(table continues)

Context	Best Comp	% Ind	% Col	Target Stimulus	% Ind	% Col
Susie knew the answer so she raised her	hand	96	100	fingers	32	16
He looked in the kitchen for something to	eat	96	96	food	60	32
The bad news we heard made us very	sad	80	80	happy	32	76
I promised my husband I would always love	him	96	100	her	80	80
I forgot my mittens so my hands were	cold	96	96	hot	80	60
I couldn't see because the room was too	dark	100	100	light	60	56
My father likes to have some peace and	quiet	92	100	loud	52	32
When I get sick my mother calls the	doctor	96	100	nurse	60	68
The man on the cliff tried to jump	off	92	88	on	92	92
Then I climbed in and unlocked the front	door	100	96	open	40	24
I went to the library to get a	book	100	100	read	32	52
The next morning we were all ready to	go	96	80	stop	76	76
That yellow dress in the window is very	pretty	88	84	ugly	48	36
They went to bed after the movie was	over	92	88	under	60	56
Johnny grew up to be a very fine young	man	80	92	woman	52	72
Means		94.4	93.6		56.4	55.1

Anomalous Condition

Context	Best Comp	% Ind	% Col	Target Stimulus	% Ind	% Col
I got an invitation to go to her	party	80	100	bright	--	--
Instead of watching TV let's listen to some	music	80	88	building	--	--
With my new shoes I can run very	fast	80	80	car	--	--
She bought some milk and bread at the	store	80	84	clear	--	--

(table continues)

Context	Best Comp	% 3rd	% Col	Target Stimulus	% 3rd	% Col
The caboose is the last car in the	train	96	80	fast	--	--
My mother and the teacher had a long	talk	80	88	happen	--	--
Sometimes I forget because I have a bad	memory	96	80	like	--	--
He drove to work in his big new	car	80	96	memory	--	--
Before you eat make sure your hands are	clean	80	84	music	--	--
The new baby is a he not a	she	84	84	party	--	--
Mother and Dad are away on a long	trip	80	100	pocket	--	--
We waited a long time for something to	happen	92	80	school	--	--
The children watched the cars go down the	street	80	100	she	--	--
I couldn't see because the sun was too	bright	96	80	store	--	--
All the children got up to go to	school	96	80	street	--	--
He reached down for the keys in his	pocket	96	80	talk	--	--
Dad works on the top floor of the	building	80	92	train	--	--
Chicken and fish are two foods I really	like	96	80	trip	--	--
Means		86.2	86.4			

APPENDIX B

Stimuli Used in Experiment 2

Acceptable Related Condition

Context	Best Cued	% Ald	% Col	Target Stimulus	% Ald	% Col
They went to school in a big yellow	bus	100	92	car	36	32
To buy a present I need some more	money	96	100	dollars	36	28
He hit the ball right between the man's	legs	84	96	feet	44	32
Susie knew the answer so she raised her	hand	96	100	fingers	40	18
What time today is the race going to	start	80	84	finish	36	96
My room was so dark that I got	scared	88	80	frightened	48	72
The baseball hit the house and broke the	window	92	96	glass	48	36
Mary went over to play at her friend's	house	96	84	home	72	80
Dad works on the top floor of the	building	80	88	house	36	20
I didn't go to school because I was	sick	100	84	ill	32	48
I fell off my bike and skinned my	knee	96	92	leg	44	40
I couldn't see because the sun was too	bright	80	100	light	64	48
She turned on the light so she could	see	96	96	look	36	40
Last Saturday turned out to be a beautiful	day	100	96	night	32	80
When I get sick my mother calls the	doctor	96	100	nurse	72	68

(table continues)

Context	Best Comp	% Ord	% Col	Target Stimulus	% Ord	% Col
I never want to do anything like that	again	96	92	over	36	32
The children watched the car go down the	street	96	80	road	44	28
In the garden I smelled a very beautiful	flower	80	84	rose	24	36
I went to bed because I was so	tired	80	80	sleepy	56	76
The sky turned dark and it started to	rain	96	88	snow	40	48
Instead of watching TV let's listen to some	music	80	84	songs	60	28
The elevator broke so we walked up the	stairs	92	96	steps	40	20
One boat is long and the other is	short	84	96	tall	36	88
My family moved from the country to the	city	96	96	town	40	32
That yellow dress in the window is very	pretty	88	84	ugly	48	36
All the old apple trees must be cut	down	96	100	up	48	56
All the children got up to go to	school	92	80	work	44	20
Means		91.0	91.0		45.6	46.9

Acceptable Unrelated Condition

Context	Best Comp	% Ord	% Col	Target Stimulus	% Ord	% Col
The bad news we heard made us very	sad	80	96	angry	04	04
The farmer told us that wool comes from	sheep	96	84	animals	04	04
The little girl fell down and started to	cry	96	96	bleed	04	04
He drove to work in his big new	car	80	80	bus	08	04
He grew a big black beard on his	face	84	88	chin	08	08
My mother and the teachers had a long	talk	96	80	dinner	04	04
The man on the cliff tried to jump	off	92	88	down	08	04
The farmer went to milk the very big	cow	96	96	goat	04	04

(table continues)

Context	Best Corp	% 3rd	% Col	Target Stimulus	3rd	Col
My father likes to have some peace and	quiet	92	96	happiness	04	04
I stopped at the store on my way	home	92	84	here	04	08
I promised my husband I would always love	him	96	96	it	04	04
I always wished that I could fly like a	bird	80	84	jet	04	04
He looked at the sun and the blue	sky	96	84	lake	04	04
I can't go today but I can go	tomorrow	96	96	later	04	04
The caboose is the last car in the	train	80	92	line	04	08
I'm not going to worry about it very	much	84	92	long	08	08
My aunt wanted me to write her a	letter	96	92	note	04	04
They went to bed after the movie was	over	92	88	off	08	04
The pen was empty so I threw it	away	80	84	out	08	12
The children got on the horse for a	ride	92	96	picture	04	04
Johnny has five big brothers and one little	sister	92	96	puppy	08	04
On the playground we run around and have	fun	96	96	races	04	04
He was staying with his aunt and his	uncle	96	96	sister	04	04
He put all his money in the downtown	bank	96	96	store	04	04
They all went to sleep in one big	bed	96	80	tent	04	04
Bananas and oranges are my favorite kinds of	fruit	96	92	things	04	04
He took something to drink because he was	thirsty	84	96	tired	08	04
He spoke so softly that I could not	hear	92	88	wash	04	04
Means		90.9	90.4		5.1	4.9

(table continues)

Unacceptable Related Condition

Context	Best Comp	% Jrs	% Col	Target Stimulus	% Jrs	% Col
He rested in the shade under a big	tree	100	80	apple	36	20
The cat chased and tried to catch the	mouse	80	84	cheese	40	40
It is dark in the middle of the	night	92	80	day	60	96
Before you eat make sure your hands are	clean	80	84	dirty	36	80
Every fox has a white tip on its	tail	96	88	dog	40	48
Out in the rain he got cold and	wet	96	96	dry	48	72
The wind blew my hat right off my	head	100	100	eyes	32	16
Mother and Dad are away on a long	trip	96	80	fall	60	32
My grandma baked about nine loaves of homemade	bread	84	100	food	40	16
I had to ask her to tie my	shoe	92	100	foot	44	52
The player hit the ball way over the	fence	80	88	gate	36	28
The boy got the lawnmower to cut the	grass	96	80	green	56	68
He jumped in his car and away he	went	88	80	left	32	36
I've eaten so much I can't eat any	more	96	100	less	24	72
It was the very best time I ever	had	100	96	lost	36	28
Everyone went home so I was all by	myself	100	100	me	56	80
She remembered my face but she forgot my	name	84	96	person	32	16
In the winter everything is covered with white	snow	100	100	rain	32	28
The lake water was colored a beautiful dark	blue	92	80	red	36	20

(table continues)

Context	Best Comp	% 3rd	% Col	Target Stimulus	% 3rd	% Col
The cat curled up and soon went to	sleep	100	100	rest	32	32
I liked him from the first time we	met	92	96	saw	36	20
The children stopped back to take a good	look	92	92	see	56	56
The girl wanted to grow her hair very	long	100	100	short	44	68
With my new shoes I can run very	fast	96	80	slow	48	80
She combed her hair to have her picture	taken	84	96	stolen	40	40
While I'm gone do as your mother	says	80	88	talks	36	48
The boy got dirty so he took a	bath	92	92	water	32	28
I like to drink milk from a tall	glass	100	100	window	32	32
Means		92.4	93.1		40.6	46.1

Unacceptable Unrelated Condition

Context	Best Comp	% 3rd	% Col	Target Stimulus	% 3rd	% Col
The fire will burn for a very long	time	100	100	answer	--	--
I heard my stomach growl because I was	hungry	88	100	asleep	--	--
Before eating dinner I had to set the	table	100	92	book	--	--
I got an invitation to go to her	party	84	84	cat	--	--
His hair was so long he got it	cut	96	96	closed	--	--
The little girl was stung by a big	bee	88	92	cube	--	--
She asked me the secret but I wouldn't	tell	100	92	drink	--	--
Green, blue and red are my very favorite	colors	96	100	eggs	--	--
I went to the library to get a	book	100	100	fruit	--	--
Sometimes I forget because I have a bad	memory	80	96	hair	--	--
I forgot my mittens so my hands were	cold	96	96	head	--	--

(table continues)

Context	Best Comp	% 3rd	% Col	Target Stimulus	% 3rd	% Col
I go to the pool so I can	swim	92	100	hear	--	--
I couldn't see because the room was too	dark	100	100	heavy	--	--
He did what he thought was the right	thing	92	84	leaf	--	--
He looked in the kitchen for something to	eat	96	96	live	--	--
Then I climbed in and unlocked the front	door	100	96	moon	--	--
The door was unlocked so I used my	key	96	100	test	--	--
First he looked over here and then over	there	100	100	today	--	--
If you don't have a pencil use a	pen	92	100	weed	--	--
Hopscotch and jacks are two fun games to	play	100	92	write	--	--
He failed because he could not subtract or	add	100	84	open	--	--
The new baby is a he not a	she	80	100	peach	--	--
I will cut up some wood for the	fire	100	96	plate	--	--
My father always uses too much pepper and	salt	100	96	poster	--	--
Johnny grew up to be a fine young	man	80	92	shoe	--	--
She didn't want to tell how old she	was	92	96	stopped	--	--
He reached down for the keys in his	pocket	80	100	morning	--	--
My balloon got away and I couldn't catch	it	100	100	lion	--	--
Means		93.9	96.0			

Note: The values represent the percent of third grade students and college students who responded with the corresponding word in a sentence completion or word association task. The abbreviation "Best Comp" stands for Best Completion Word, and the colusn labeled "Target Stimulus" is the word actually presented in the experiment.

Footnote

1. Portions of this paper were presented at the meeting of the Society for Research in Child Development, Detroit, 1983. Thanks are extended to the children and staff of Tilton Elementary School, Rochelle, Illinois for their cooperation and to Dayle Ashley and Emily Richardson for their assistance in data collection. Requests for reprints should be addressed to Frederick M. Schwantes, Department of Psychology, Northern Illinois University, DeKalb, IL 60115.

Table 1

Mean Response Times in Msec (and mean error proportions) for Each Grade as a Function of Target Completion Condition in Experiment One

	Third Grade			College Grade		
	No Context	Context	Context Effect	No Context	Context	Context Effect
Target Condition						
Best Completion	825	650	175	611	517	94
	(.07)	(.04)		(.01)	(.01)	
Less Likely	826	728	98	596	564	32
	(.04)	(.07)		(.02)	(.01)	
Related	827	756	71	598	571	27
	(.06)	(.09)		(.00)	(.02)	
Anomalous	806	890	-84	632	633	-1
	(.10)	(.09)		(.02)	(.01)	

Table 2

Mean Response Times in Msec (and mean error proportions) for Each Grade as a Function of Target Completion Condition in Experiment Two

	Third Grade			College Grade		
	No Context	Context	Context Effect	No Context	Context	Context Effect
Target Condition						
Acceptable-Related	785 (.06)	708 (.03)	78	590 (.05)	563 (.03)	27
Acceptable-Unrelated	797 (.04)	718 (.04)	79	598 (.04)	572 (.05)	26
Unacceptable-Related	760 (.03)	733 (.03)	27	596 (.02)	572 (.04)	24
Unacceptable-Unrelated	783 (.04)	856 (.07)	-73	620 (.04)	619 (.02)	1